

US Ecology Remedial Investigation

**NATURE AND EXTENT OF  
CONTAMINATION**

Presented By: Fred Biebesheimer  
23 April 2009

# REVIEW OF TARGET ANALYTE SCREENING

- ④ No constituents exceeded soil direct contact screening levels under either industrial (Method C) or unrestricted (Method B) land use.
- ④ Nitrate, nitrite, methylene chloride, and hexavalent chromium exceeded screening criteria in soil for protectiveness of groundwater
- ④ Arsenic, hexavalent chromium, trichloroethene, and uranium exceed screening levels in groundwater
- ④ Several volatile organic compounds in soil vapors exceed conservative screening levels

# HAZARDOUS SUBSTANCES REQUIRING FURTHER EVALUATION

- ⦿ Evaluate output from screening
- ⦿ Determine whether screening output should be further modified based on project considerations
- ⦿ Determine what constituents that did not exceed screening levels should be carried forward due to availability in the environment

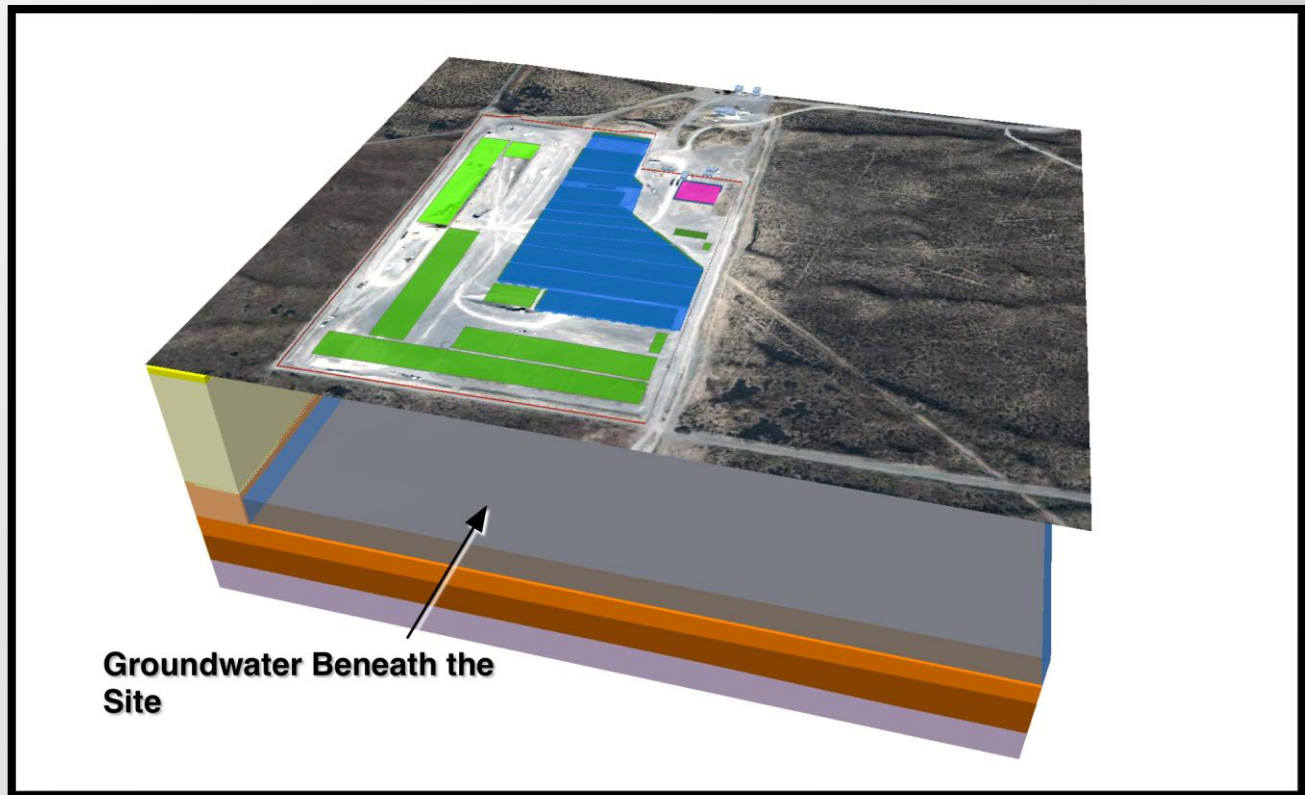
# NATURE AND EXTENT OF CONTAMINATION

- ◎ Discuss distribution of hazardous substances requiring further evaluation (COPCs) by Decision Unit
  - Groundwater
  - Resin Tank Area
  - Pre-1985 Trench Area
- ◎ Discuss source and interrelation of contaminant distribution

US Ecology Remedial Investigation

**NATURE AND EXTENT OF  
HAZARDOUS SUBSTANCES  
IN GROUNDWATER**

## GROUNDWATER BENEATH THE US ECOLOGY SITE



- Unconfined Aquifer
- Top is in the Ringold Unit E
- Base is the Ringold Lower Mud
- 7 Monitoring Wells
- Groundwater flow is eastward

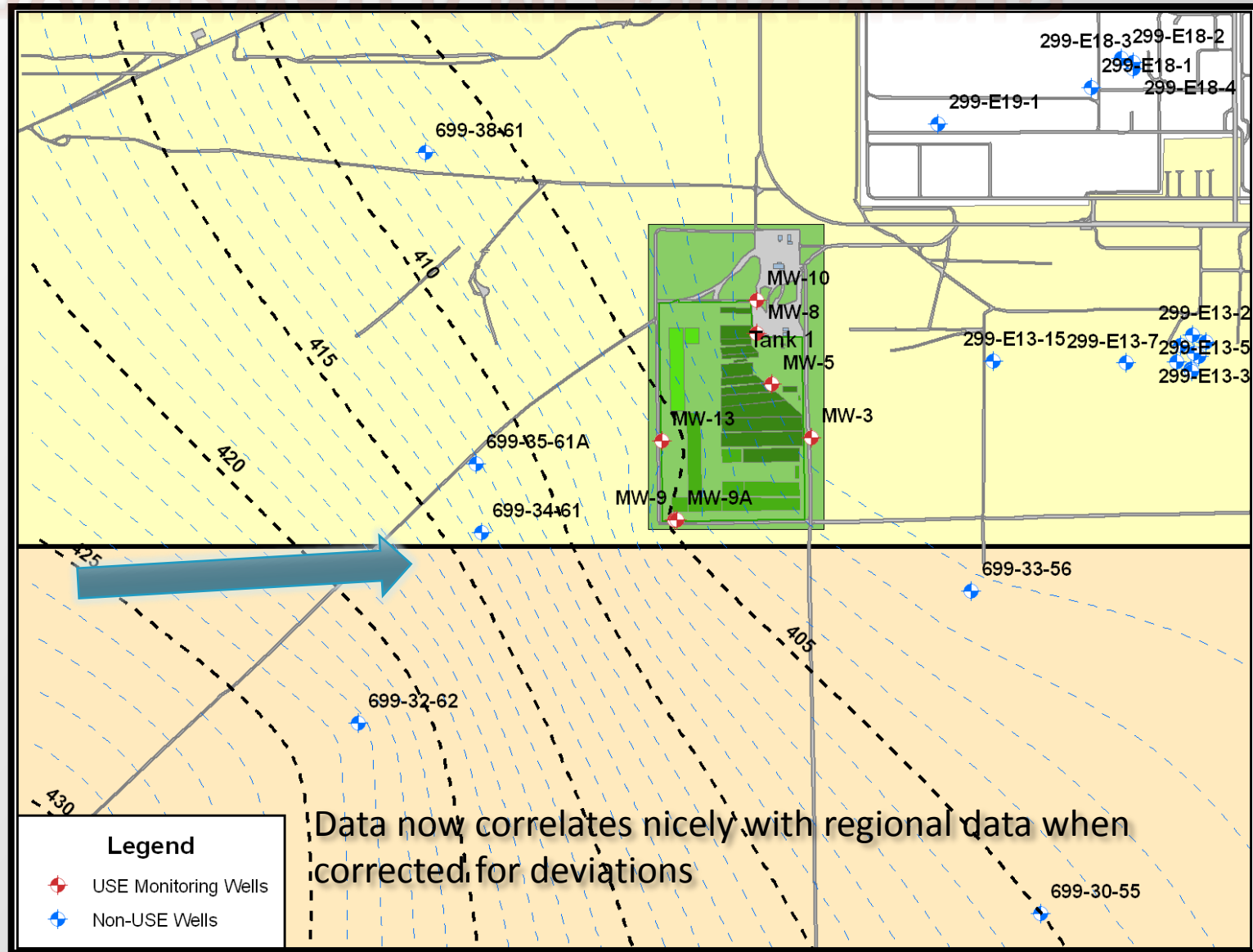
# GROUNDWATER MEASUREMENTS

Used results from civil survey and gyroscopic survey to normalize depth to water measurements and establish Correction Factors

Well	Max Deviation & Depth (degrees, meters)	Depth Measured	Depth Vertical	Difference Measure – Vertical
MW-3	2.1 degrees at 93.5 m	306.678 ft	306.606 ft	0.072 ft
MW-5	3.7 degrees at 94.1 m	308.781 ft	308.725 ft	0.056 ft
MW-8	3.4 degrees at 97.1 m	318.617 ft	318.345 ft	0.272 ft
MW-9	1.3 degrees at 97.5 m	319.985 ft	319.893 ft	0.092 ft
MW-9A	0.8 degrees at 97.5 m	319.952 ft	319.923 ft	0.030 ft
MW-10	1.9 degrees at 98.3 m	322.659 ft	322.600 ft	0.059 ft
MW-13	3.4 degrees at 94.0 m	308.391 ft	308.286 ft	0.105 ft



# GROUNDWATER MEASUREMENTS



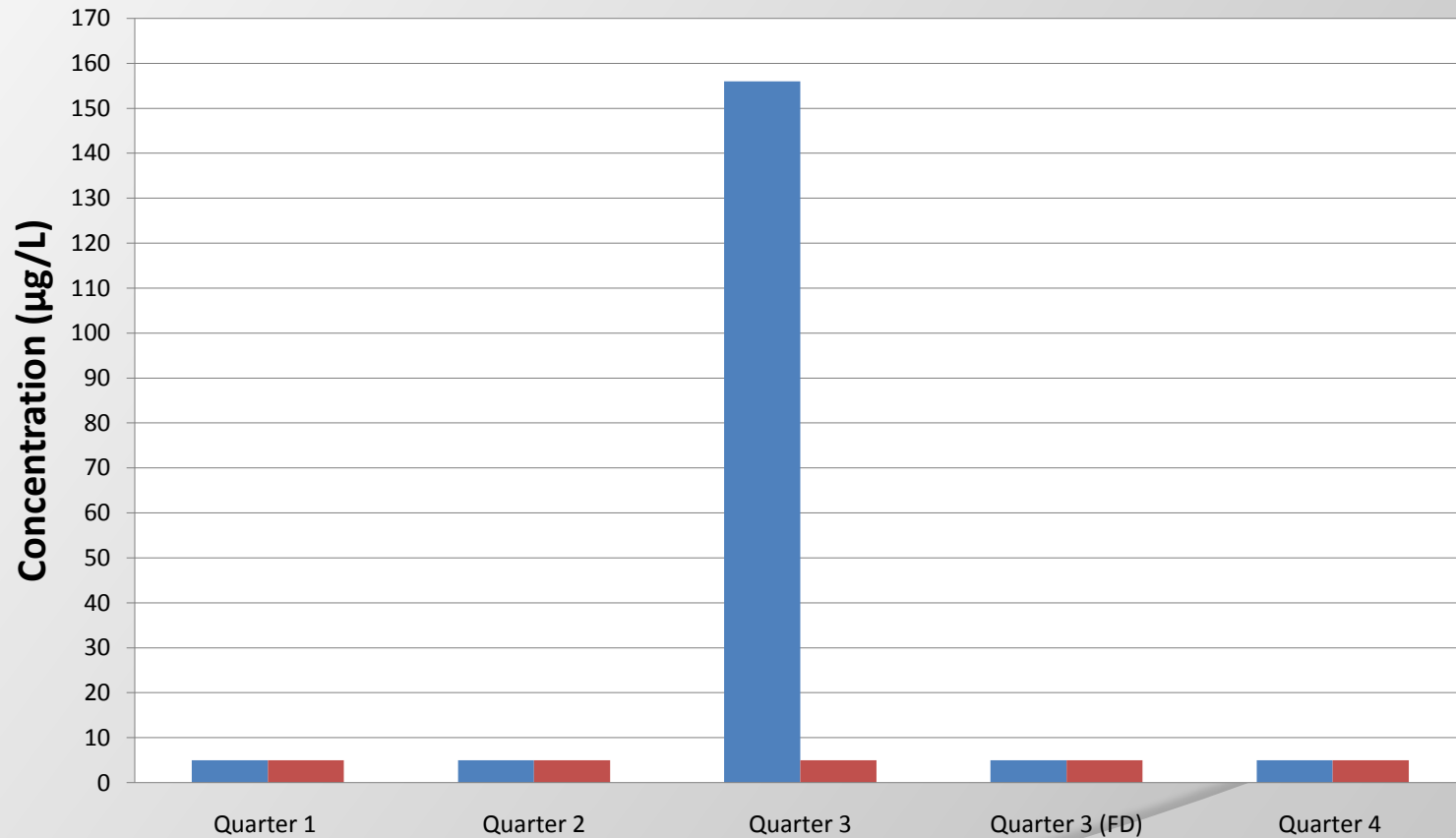


# ANOMALOUS HAZARDOUS SUBSTANCES IN GROUNDWATER

- ⦿ Will continue to evaluate and monitor, but not drive feasibility study unless there is a change in monitoring trends
- ⦿ Uranium — 1 high detection (156  $\mu\text{g/L}$ ) in the up-gradient monitoring well
- ⦿ Arsenic — The concentrations (max detect 4.8  $\mu\text{g/L}$ ) are above screening levels, but consistent with results in nearby wells

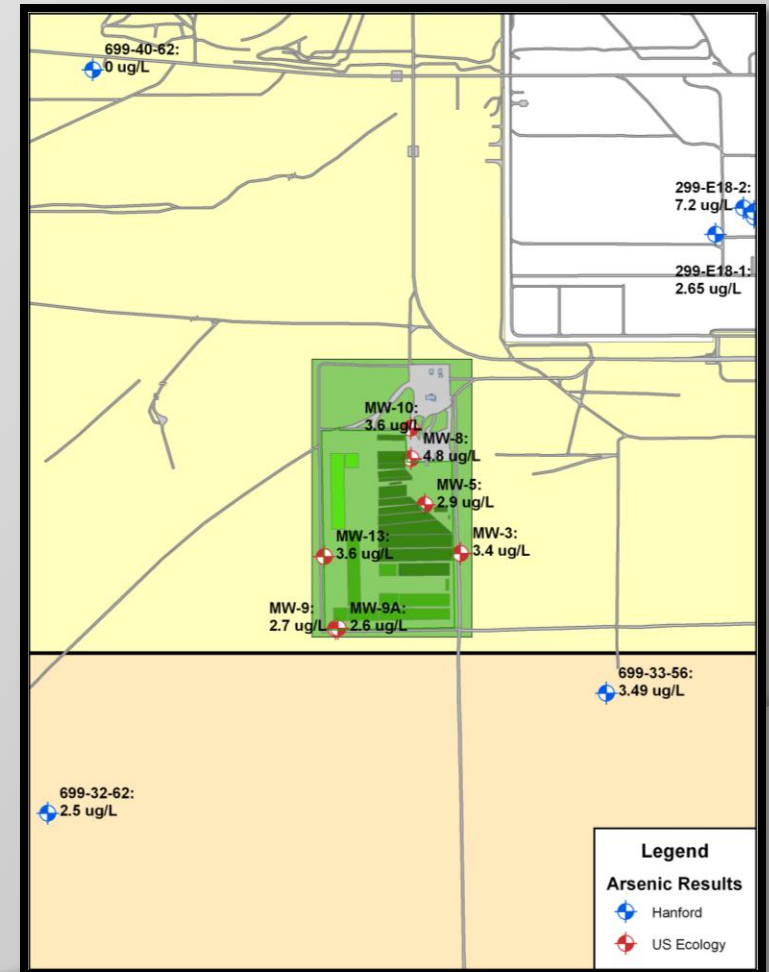
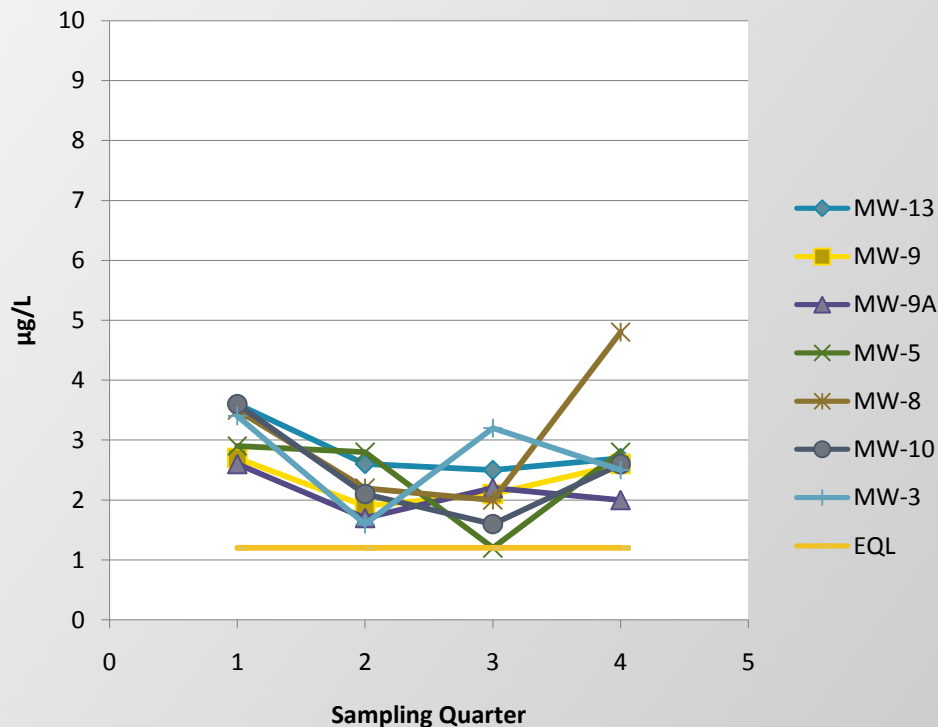
# ANOMALOUS HAZARDOUS SUBSTANCES IN GROUNDWATER (CONT.)

Uranium Concentration MW-13



# ANOMALOUS HAZARDOUS SUBSTANCES IN GROUNDWATER (CONT.)

Arsenic is consistent with background concentrations



# GROUNDWATER COPCS

- ⦿ Hexavalent Chromium
  - ⦿ EPC of 71  $\mu\text{g/L}$  and a Max Detect of 100  $\mu\text{g/L}$
  - ⦿ 32 Detects in 32 Samples

# GROUNDWATER COPCS (CONT.)

## ⦿ Trichloroethene

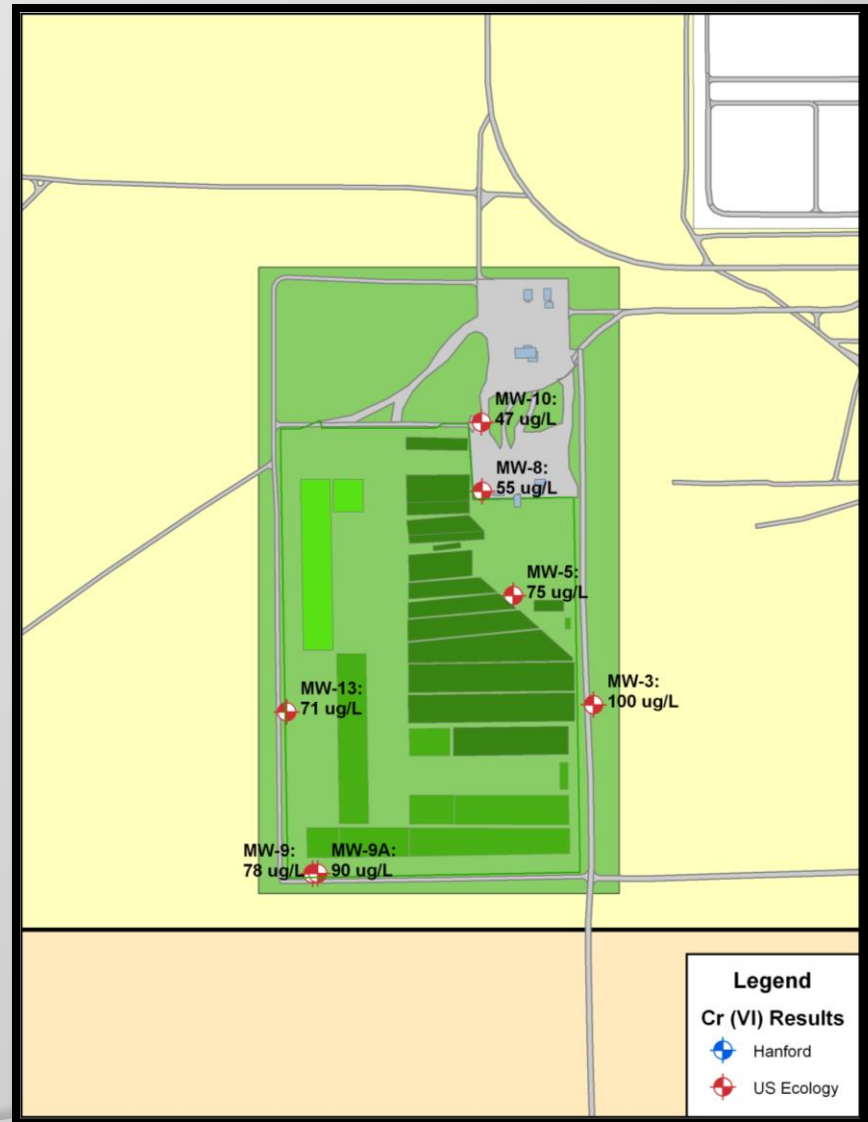
- ⦿ EPC of 8.4 µg/L and Max Detect of 27 µg/L
- ⦿ Total of 9 Detects in 32 Samples

## ⦿ Chloroform

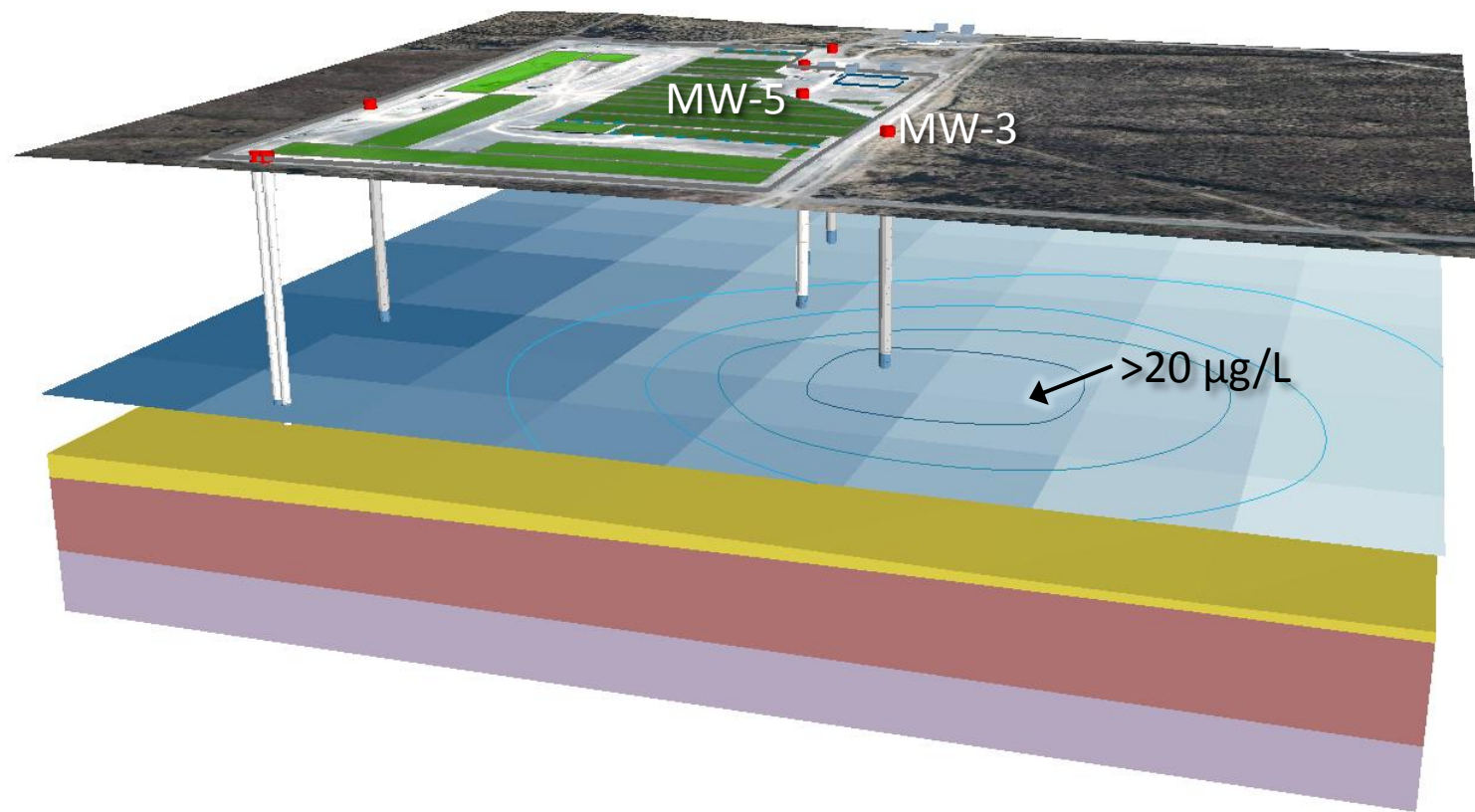
- ⦿ EPC of 9.7 µg/L and Max Detect of 22 µg/L
- ⦿ Total of 12 Detects in 32 Samples
- ⦿ While not exceeding screening levels, it was included because of the collocation with trichloroethene concentrations and soil vapor concentrations

# GROUNDWATER DECISION UNIT

- Hexavalent Chromium
  - Max Detect – 100  $\mu\text{g/L}$
  - No exceedences in non-USE wells



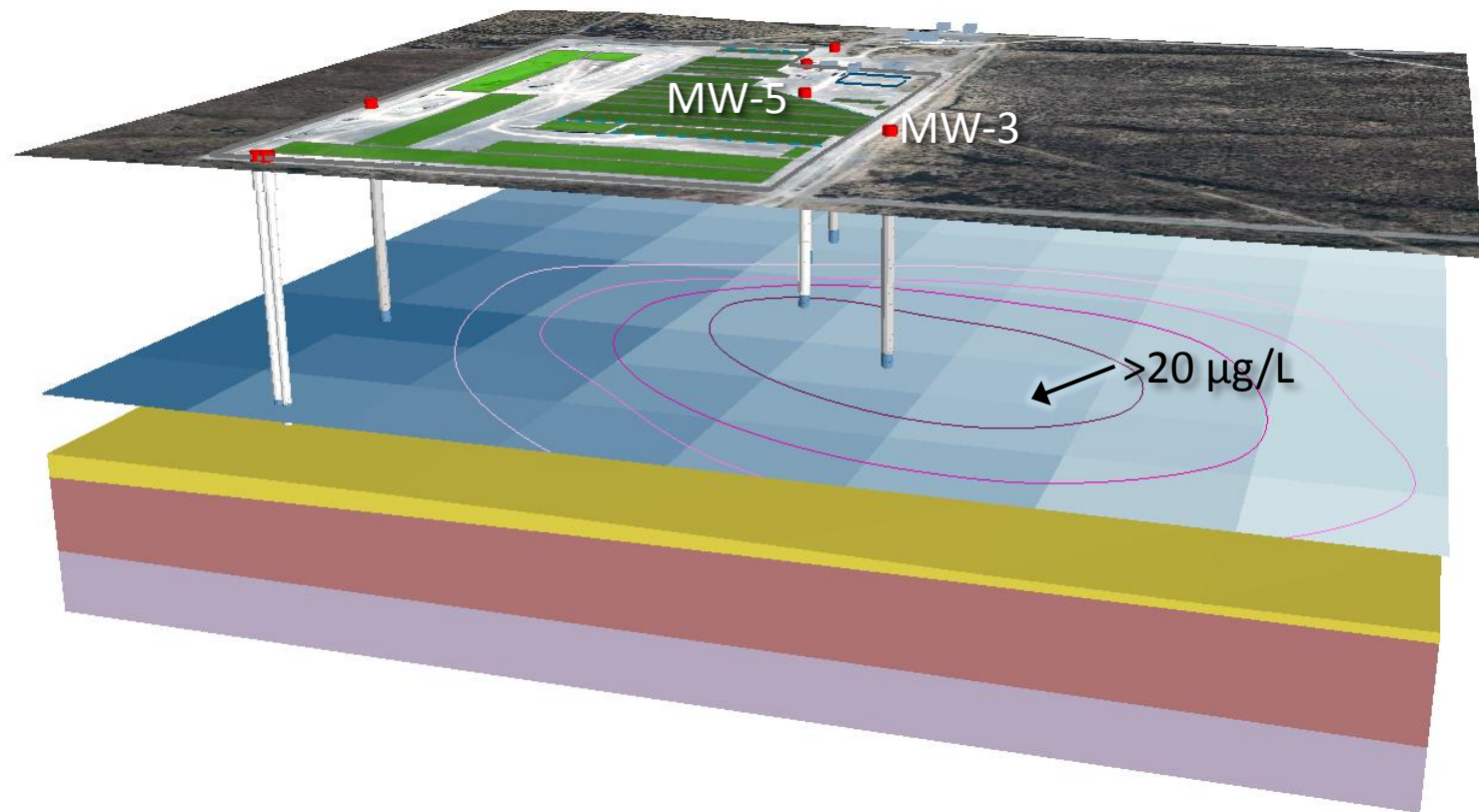
# GROUNDWATER DECISION UNIT



Trichloroethene — 9 Detects, Max of 27 µg/L



# GROUNDWATER DECISION UNIT (CONT.)



Chloroform— 12 Detects, Max of  $22 \mu\text{g/L}$

# GROUNDWATER DECISION UNIT SOURCE DISCUSSION

- ◎ Simple flow estimates show likely source of chloroform and trichloroethene may be from central portion of the pre-1985 Trench Areas
  - Quarterly monitoring data is stable
  - Significant concentrations of these substances in soil vapor
  - Not significant concentrations in soil sample results
  
- ◎ Hexavalent chromium likely from Resin Tank Area source discharges

US Ecology Remedial Investigation

**NATURE AND EXTENT OF  
HAZARDOUS SUBSTANCES  
IN SOIL**

# ANOMALOUS HAZARDOUS SUBSTANCES IN SOIL

- ◎ These constituents were detected above screening levels, and will be considered in the Feasibility study, but will not drive alternative selection:
  - Nitrite – detected in only one sample (of 127) at 3x PGS (2.68 mg/kg) in the Resin Tank Area
  - Methylene chloride – 2 estimated detects in 127 samples in the Pre-1985 Trench Area
    - These results were estimated detects below the quantitation limit.
    - Common laboratory contaminant

# SOIL COPCS

- ◎ Nitrate – EPC (16 mg/kg) is less than 2x PG (9.5 mg/kg)
  - Found in 95 of 127 soil samples
  - Max Detect of 243 mg/kg in Resin Tank Area
  - Some detects at lower concentrations deeper in the vadose zone

# SOIL COPCS (CONT.)

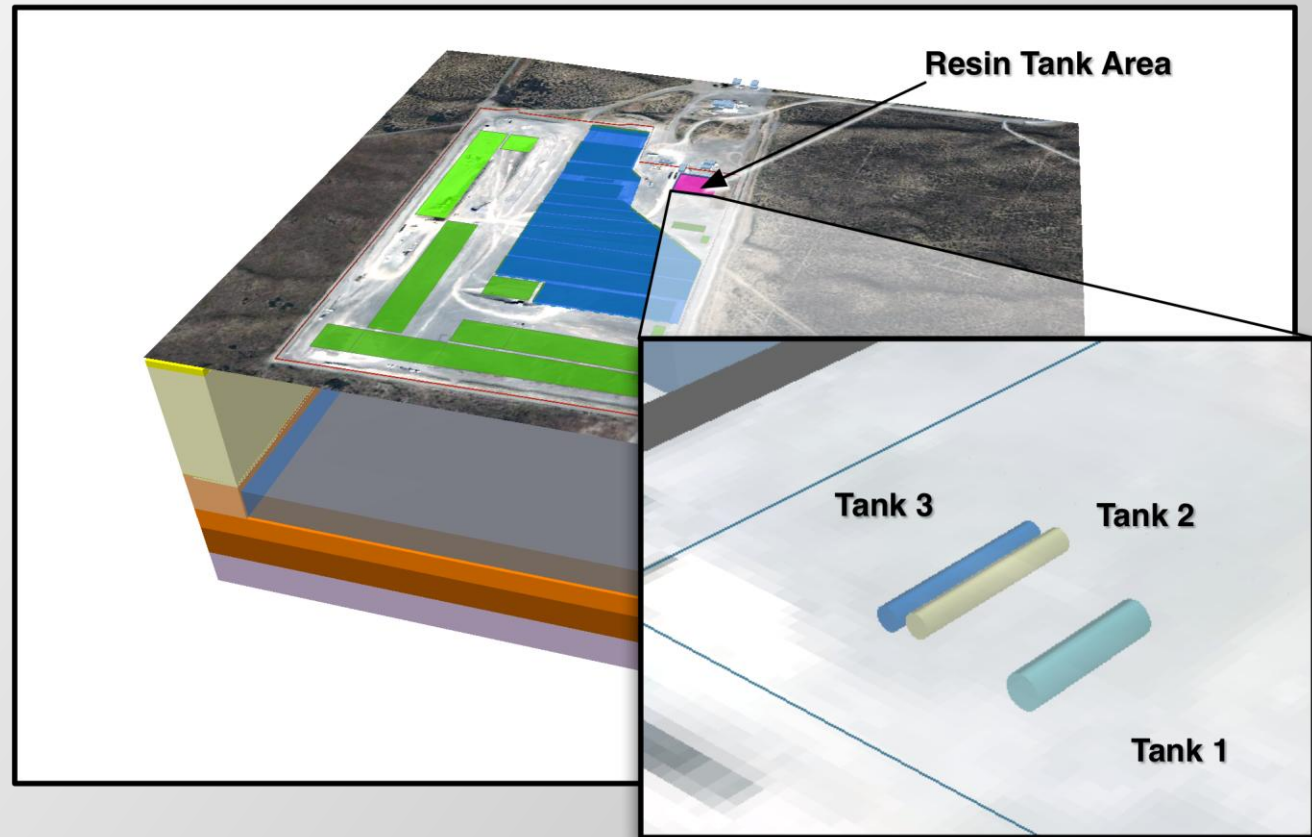
- ◎ Hexavalent chromium EPC (.39 mg/kg) exceeded conservative PGS screening levels
  - Found in 46 of 127 soil samples
  - Max Detect of 3.6 mg/kg in Resin Tank Area
  - Some detects at lower concentrations deeper in the vadose zone

# HAZARDOUS SUBSTANCES IN SOIL VAPOR

- ◎ Based on MTCA guidance (WAC 173-340-750) many analytes (19) exceeded conservative air screening levels
  - Mostly chlorohydrocarbons and fluorochlorohydrocabons
  - Four marker compounds carried forward to nature and extent evaluation (Concentration and prevalence)
    - Trichloroethene (Max of 690 ppm) — exceeds ESLs
    - Chloroform (Max of 96 ppm) — exceeds ESLs
    - Chlorotrifluoroethene [R113] (Max of 6,900 ppm)
    - 1,1,2-Trichlorotrifluoroethane (Max of 270 ppm)

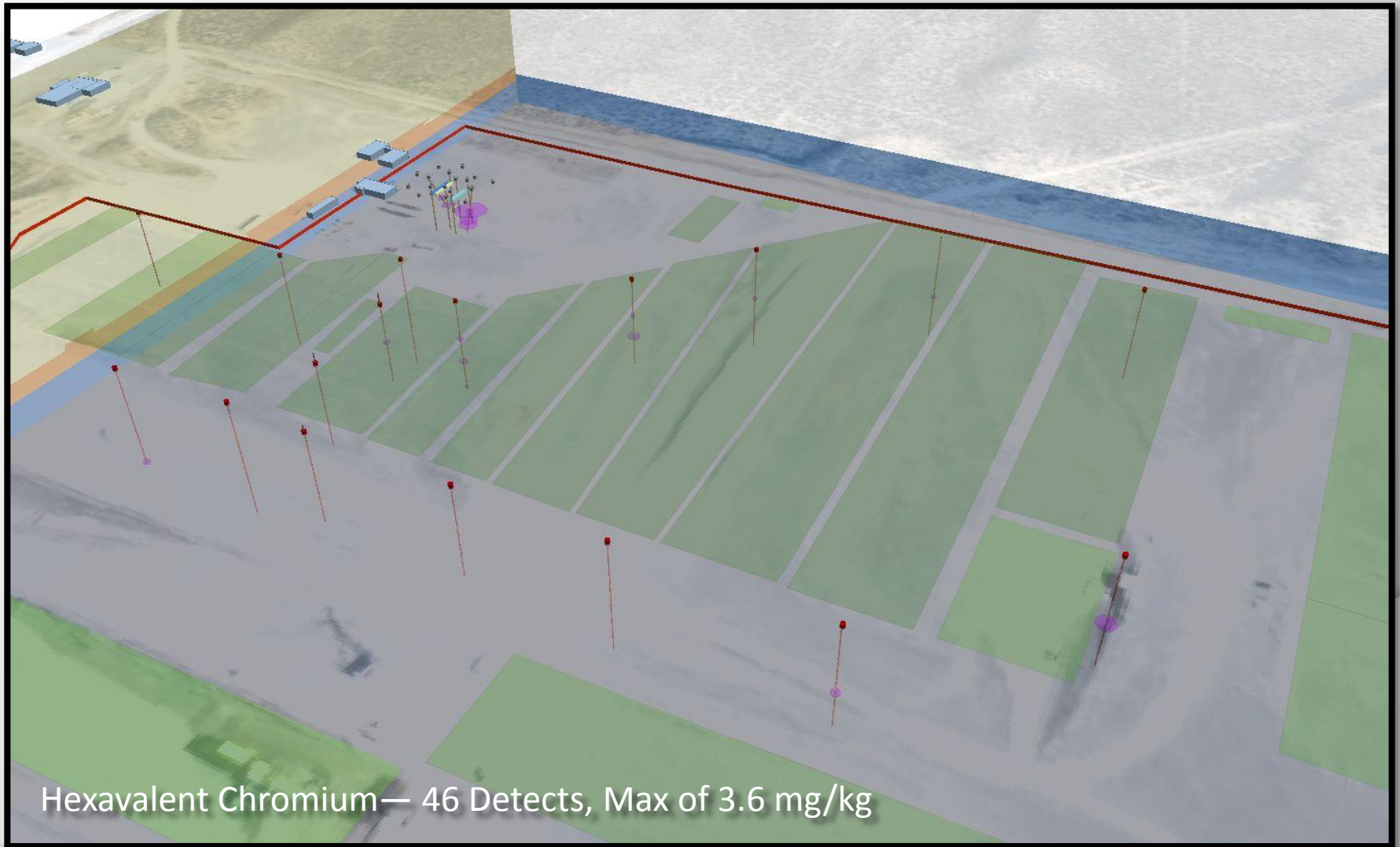


## RESIN TANK AREA

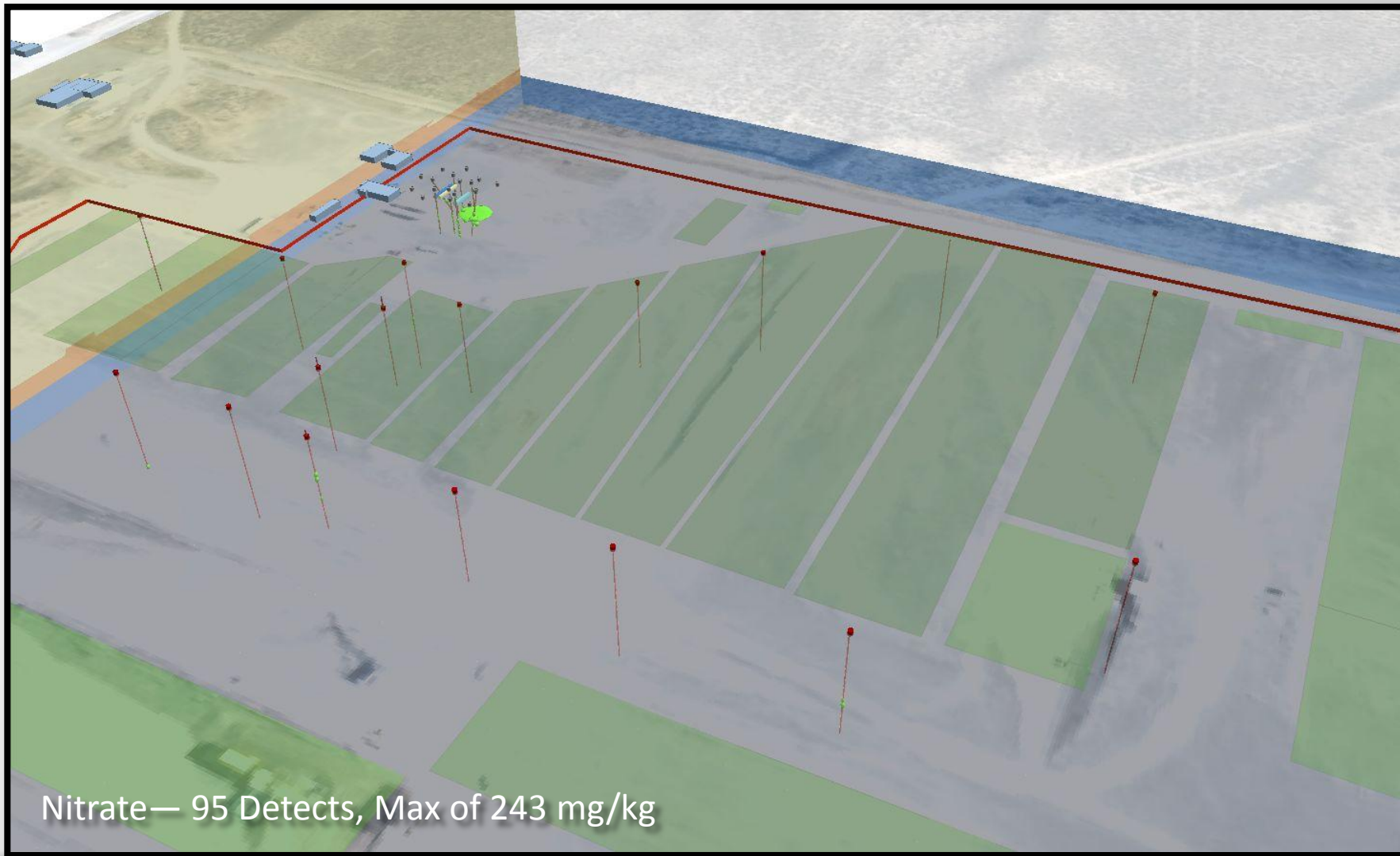


- Five underground tanks were installed for treatment of low-level radioactive resin wastes (2 1000 gal tanks, 3 23,000 gal tanks)
- Rapid snow-melt in 1985 generated run-off which ran in to a tank causing an overflow release of ~100 gallons
- Two small tanks were removed, and the others emptied and grouted in 1986

# RESIN TANK AREA DECISION UNIT



# RESIN TANK AREA DECISION UNIT (CONT.)

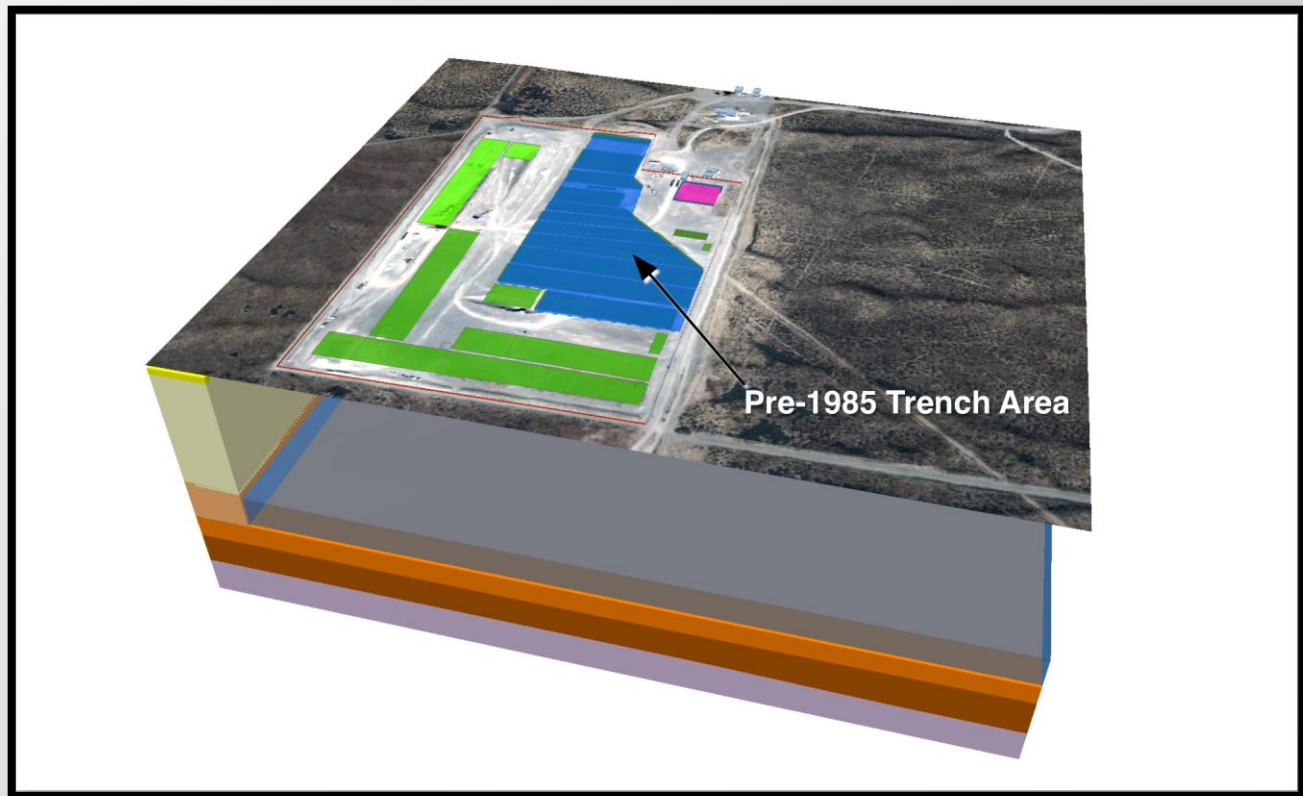




# RESIN TANK AREA DECISION UNIT SOURCE DISCUSSION

- ◎ Highest concentrations of nitrate and hexavalent chromium occur in the Resin tank area
  - Greatest concentrations are approximately 20-30 ft bgs
  - Not present in shallow samples, suggesting flood event was not the source of the material, rather historic tank operations or leaks are more likely
  - Flood event was a likely driver in migration
  
- ◎ Nitrate and hexavalent chromium are present in the Pre-1985 Trench Area, but at much lower concentrations and deeper depths, suggesting a southwesterly component to migration vadose zone

## PRE-1985 TRENCH AREA



- Prior to 1985, several trenches received waste with chemical constituents
- Trenches are 300-700 feet long, 50-80 feet wide, and 30-50 foot deep.
- Early waste packaging did not meet the same standards of contemporary disposal
- Early packaging included drums, fiberboard drums, cardboard, wood and metal boxes

# PRE-1985 TRENCH AREA DECISION UNIT

- ⦿ Hexavalent chromium and nitrate present at deeper depths and lower concentrations than in the Resin Tank Area
- ⦿ Extremely high concentrations of soil vapors, mostly in the south-eastern portion of the decision unit

# PRE-1985 TRENCH AREA DECISION UNIT SOURCE DISCUSSIONS

- ① Hexavalent chromium and nitrate distribution is most likely due to migrating materials from resin tank releases
- ① Very high concentrations of chlorinated and fluorinated hydrocarbons consistent with trench emplaced wastes



# NATURE AND EXTENT SUMMARY

## ⦿ Groundwater

- Trichloroethene – Pre-1985 Trench source
- Chloroform — Pre-1985 Trench source
- Hexavalent Chromium – Resin Tank Area source

## ⦿ Resin Tank Area

- Hexavalent Chromium — tank source
- Nitrate — tank source

## ⦿ Pre-1985 Trench Source

- Chlorinated and Fluorinated Hydrocarbon Soil gases— Trench-emplaced wastes

# PATH FORWARD

- ⦿ Data developed for this investigation is consistent and of sufficient quality
- ⦿ The data is appropriate for evaluating cleanup alternatives for hazardous constituents
- ⦿ Preparing the remedial investigation report
- ⦿ Commencing work on Feasibility Study